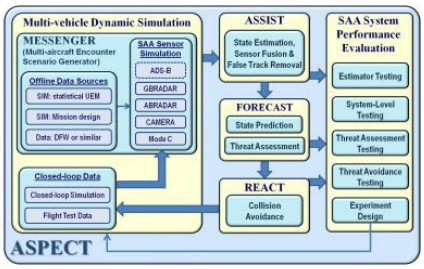
Active Project (2015 - 2017)

ASPECT (Automated System-level Performance Evaluation and Characterization Tool), Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

SSCI has developed a suite of SAA tools and an analysis capability referred to as ASPECT (Automated System-level Performance Evaluation and Characterization Tool). ASPECT encapsulates our airspace encounter generator, sensor/tracker fusion algorithms, and prediction, threat assessment, and avoidance modules. It also provides both component-level and system-level analysis that is required for evaluating how well SAA sensors and software meet fundamental safety requirements for UAS in the NAS. ASPECT consists of MESSENGER (Multi-aircraft Encounter Scenario Generator), ASSIST (AsynchronouS Sensor fusIon SysTem), FORECAST (Fast On-line Prediction of Aircraft State Trajectories), and REACT (Rapid Encounter Avoidance & Conflict Resolution) modules. Initial versions of FORECAST and REACT were designed under related projects. Phase I developed the ASSIST (Asynchronous Sensor Fusion System) capability, which fuses combinations of SAA sensors such as GRB, ABR, camera, and Mode C transponder for localizing non-communicating threats. ASPECT was then used to analyze ASSIST's estimation accuracy, with the objective of achieving the precision of ADS-B and rejecting spurious/clutter tracks. Phase II will: (i) Expand and validate the underlying sensor models and demonstrate capability using flight test data generated at Olin College (Needham, MA), (ii) Extend our REACT system, and (iii) Carry out SAA system-level analyses using ASPECT to illustrate the relationship between sensor suite (hardware) selection, component SAA software modules, and achievable safety performance of the integrated system. The result of Phase II efforts will be a complete flow-down error and risk analysis framework, which constitutes a major step toward the integration of UAS into the National Airspace System. Phase II plans have been reviewed by NASA's UAS Traffic Management Program and AeroVironment (letters of support attached), who we anticipate to be one of our early transition partners.



ASPECT (Automated System-level Performance Evaluation and Characterization Tool)

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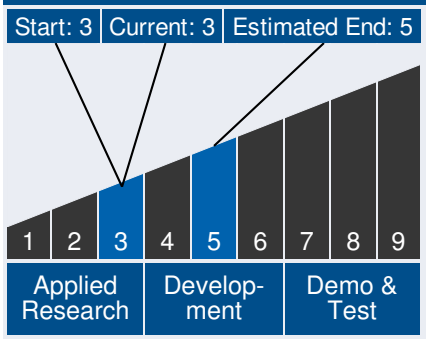

Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

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ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: ASPECT technology will have immediate applications in NASA programs focused on integration of UAS into NAS such as the UAS Traffic Management (UTM) Program. In addition, NASA programs involving multiple collaborating UAS performing a variety of missions will substantially benefit from the ASPECT technology. This is since one of the major requirements for safe operation of multiple collaborating UAS is timely and accurate collision detection and effective collision avoidance. ASPECT will also find applications in NASA space programs where safety requirements include detection and avoidance of non-cooperative spacecraft, space debris, and small celestial bodies.

To the commercial space industry:

Potential Non-NASA Commercial Applications: The ASPECT technology will be directly applicable to military UAS carrying out missions in GPS-denied environments. In such situations, secondary sensors are the only option, and collision avoidance is to be achieved with respect to both own team members and non-cooperating threats. Other applications of ASPECT will be in law enforcement, border patrol, and perimeter surveillance missions performed using UAS in scenarios where ADS-B is intermittent or unavailable.

Management Team *(cont.)*

Program Manager:

- Carlos Torrez

Principal Investigator:

- Joseph Jackson

Technology Areas

Primary Technology Area:
Aeronautics (TA 15)
- Safe, Efficient, Growth in Global Aviation (TA 15.1)
  - System-Wide Safety, Predictability, and Reliability through Full NextGen Functionality (TA 15.1.2)
    - Optimize Air/Ground Functional Allocations (TA 15.1.2.3)

Secondary Technology Area:
Robotics and Autonomous Systems (TA 4)
- Sensing and Perception (TA 4.1)
  - Object, Event, and Activity Recognition (TA 4.1.4)

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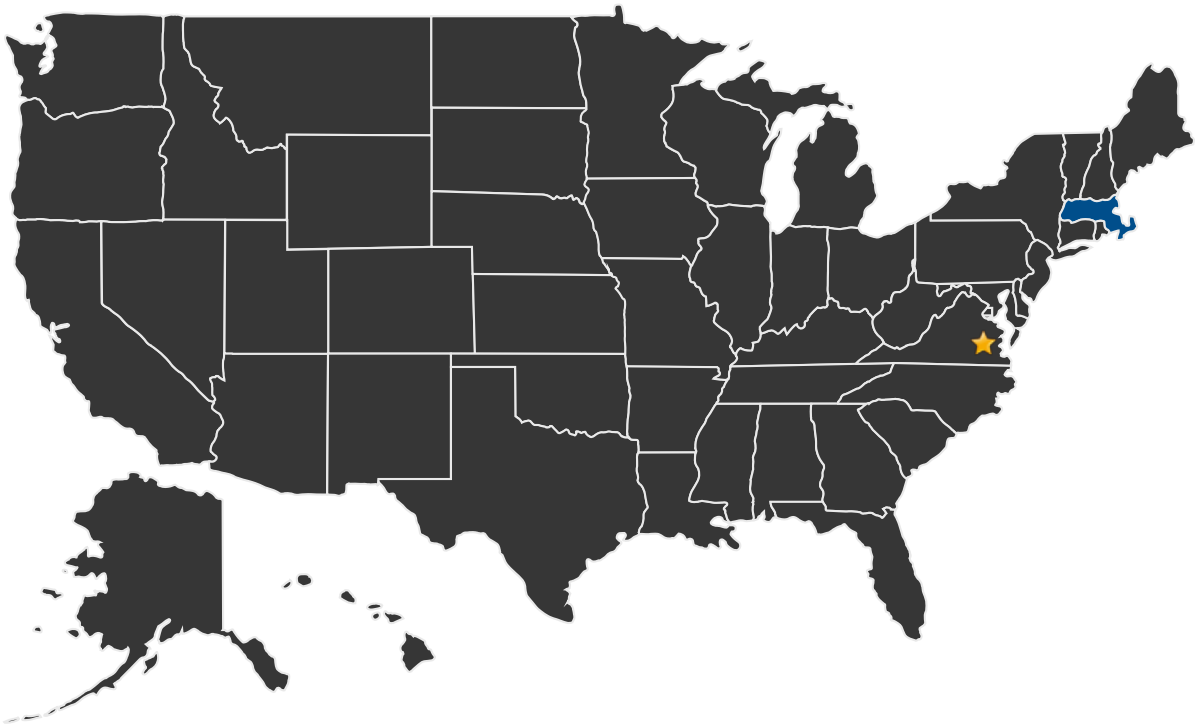
U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Langley Research Center

Other Organizations Performing Work:

- Scientific Systems Company, Inc. (Woburn, MA)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/17917)

DETAILS FOR TECHNOLOGY 1

Technology Title

ASPECT (Automated System-level Performance Evaluation and Characterization Tool)